

THE NEUTRALIZATION OF HCl WITH KOH

The purpose of this lab is to react an acid with a base and find some of the properties of the products.

DATA volume of HCl used = 10.0 mL

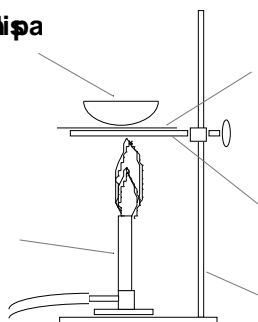
volume of KOH in graduated cylinder (at beginning) = 15.0 mL

volume of KOH in graduated cylinder (at the end) = _____

PROCEDURE

1. Pour a bit more than 10.0 mL of hydrochloric acid solution (HCl) into a 10 or 25 mL graduated cylinder. **Use a pipette to remove enough HCl to leave exactly 10.0 mL in the cylinder.** Discard the extra HCl into a spare beaker.
2. Pour a little more than 15.0 mL of potassium hydroxide solution (KOH) into a separate 25 mL graduated cylinder. **Use a clean pipette to remove enough KOH to leave exactly 15.0 mL in the cylinder.** Discard the extra KOH into the spare beaker and wash the beaker in the sink (be careful not to splash stuff out of the beaker when washing out the beaker).
3. The HCl and KOH solutions have exactly the same concentration. Pour the HCl in the graduated cylinder into a clean 100 mL beaker. **Add 2 drops of bromthymol blue to the solution in the beaker.** Put the beaker on white paper to help make the colour in the beaker easier to see.
4. Use a clean dropper to add about 9 mL of the KOH solution from your graduated cylinder into your beaker of acid, and gently swirl the liquid in the beaker (be careful not to swirl too forcefully, so as to prevent liquid from leaving the beaker). At this point the solution should still be yellow.
5. Add more KOH solution, one drop at a time, with swirling after every drop, until the solution turns green (perfect! It is NEUTRAL) or blue green (oops, you overshot by 1/2 a drop! No big deal.). Then stop and put the remaining KOH in the dropper back into the graduated cylinder containing the KOH. **In your DATA table, record how much KOH solution is left in the cylinder.**
6. Pour the solution in the beaker into a clean evaporating dish and set up the apparatus shown below.

**Evaporating dish
with solution**



7. Heat the solution in the evaporating dish with the bunsen burner until the water present has evaporated. **CARE!** The contents of the evaporating dish will “splatter” during the last bit of heating — stand back so as not to be hit with bits of hot solid material. When the dish is dry, scrape the solid into a clean and dry 100 mL beaker.
8. **Describe the appearance (colour and form) of the solid.** Add about 2 or 3 mL of distilled water to the solid in the beaker and stir with a glass stirring rod for a minute.
 - (a) **Record what you see when the water is stirred into the solid you made.**
 - (b) **Record whether the solution conducts electricity.** (Demonstrated by your teacher)

DISCUSSION QUESTIONS

1. The changes in colour you observed when adding KOH to HCl were caused by the bromthymol blue. What is the special name for a substance that acts like bromthymol blue?
2. Your DATA contains a record of the volume of KOH you had in the graduated cylinder at the start of the addition process and at the end of the addition process.
 - (a) What volume of KOH solution DID YOU ACTUALLY ADD TO THE HCl?
 - (b) In order to create a NEUTRAL mixture, did you have to **add** less KOH than HCl, more KOH than HCl or more or less equal amounts of KOH and HCl? How does your DATA show your answer to be true?
3. The chemical reaction in this lab is $\text{HCl} + \text{KOH} \rightarrow$ two products.
 - (a) One product of the reaction is the result of joining an H (from HCl) with OH (from KOH).
 - (i) What is the name and formula of this first product?
 - (ii) Where did this product go when the reaction mixture was heated?
 - (b) The other product is made from the "left over atoms" after H and OH are removed from the reactants.
 - (i) What is the formula of the molecule made from the "left over atoms"?
 - (ii) What is the name of this compound?
4. Chemical reactions are supposed to form new compounds. Was a new compound formed in this lab? Explain clearly why you answered "yes" or "no".
5. If a compound conducts electricity when dissolved in water, you can be sure that the compound is actually made up of ions. What ions are present in the compound you dissolved in step 8 of the procedure? (This is the same compound referred to in DISCUSSION QUESTION 3(b).)